

Amendment
Serial No. 10/625,094

Docket 5000-1-428

IN THE CLAIMS:

Please amend the claims as follows:

1. (Currently Amended) A redundant apparatus for a GE-PON (Gigabit Ethernet Passive Optical Network) system which includes an OLT (Optical Line Terminal), a splitter connected to the OLT via a working path line composed of only one optical fiber, and a plurality of ONUs (Optical Network Units) connected to the splitter via individual optical fibers, said apparatus comprising:

said working path line located between the OLT and the splitter to perform two-way communication;

a redundant path line which is composed of only one optical fiber located between the OLT and the splitter to perform two-way communication;

a switching block located in said OLT for performing either automatic or compulsory switching operation, said automatic switching operation by means of using a notification field for indicating asynchronous information contained in Ethernet OAM frame and said compulsory switching operation by means of manual manipulation by a user, said notification field in said Ethernet OAM frame receives switching information in a data frame using a flag bit adapted to transmit asynchronous information of said signaling Ethernet OAM frame between said OLT and said ONUs, and transmit the data frame including said asynchronous information, wherein said Ethernet OAM frame further includes:

a CE field generated when an undefined fault is detected;

a R/S field generated when a local data terminal equipment (STE) detected differs from expectation;

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a L/S field generated when a remote DTE detected differs from expectation;

an LF (Link Fault) field generated when there is an error in a reception end; and

a DG (Dying Gasp) field generated when there is a non-recovery error in the reception;

ONU means for detecting a transmission loss of the working path line upon receiving a signal transmitted from the OLT to one ONU among the ONUs, and for transmitting switching information of the working path line via the working path line; and

an OLT for receiving the switching information via the working path line, and for transmitting data to the ONU means via the redundant path line according to the received switching information.

2. (Original) The apparatus of claim 1, wherein said working and redundant path lines are disposed in a 1+1 configuration.

3. (Previously Presented) The apparatus of claim 1, wherein the splitter is a 2xN splitter and a switching function is preformed using the switching and the splitter within a prescribed time of 50ms.

4. (Currently Amended) An GE-PON (Gigabit Ethernet Passive Optical Network) apparatus, comprising:

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a 2xN splitter;

an OLT (Optical Line Terminal) being connected to the 2xN splitter via a first path line or a second path line, and including a switching unit for switching the first path line or the second path line upon receiving a predetermined control signal, wherein said switching unit configured for using a notification field for indicating asynchronous information contained in an Ethernet OAM frame, said notification field in said Ethernet OAM frame receives switching information in a data frame using a flag bit adapted to transmit asynchronous information of said signaling Ethernet OAM frame between said OLT and said ONUs, and transmit the data frame including said asynchronous information, wherein said Ethernet OAM frame further includes;

a CE field generated when an undefined fault is detected;

a R/S field generated when a local data terminal equipment (STE) detected differs from expectation;

a L/S field generated when a remote DTE detected differs from expectation;

an LF (Link Fault) field generated when there is an error in a reception end; and

a DG (Dying Gasp) field generated when there is a non-recovery error in the reception, and

an ONU (Optical Network Unit) for creating a switching request according to a signal environment, and transmitting the generated switching request to the OLT.

5-6. (Canceled)

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7. (Original) The apparatus as set forth in claim 4, wherein either one of the first path line and the second path line of the $2 \times N$ splitter is connected to the OLT and is adapted as a working path line, and the other one is not connected to the OLT and is adapted as a protection path line.

8. (Previously Presented) The apparatus as set forth in claim 7, wherein the splitter has a first input terminal and a second input terminal, and wherein the switching unit of the OLT disconnects the OLT from the splitter in switching the first input terminal to re-adapted the first input terminal from the working path line to the protection path line, or connects the OLT to the splitter in switching the second input terminal to re-adapt the second input terminal from the protection path line to the working path line.

9. (Original) The apparatus as set forth in claim 8, wherein the switching unit of the OLT disconnects the OLT from the splitter in switching the second path line having been adapted as the working path line to the protection path line, or connects the OLT to the splitter in switching the first path line having been adapted as the protection path line to the working path line.

10. – 12. (Canceled)

13. (Original) The apparatus as set forth in claim 4, wherein said creating occurs in response to at least one of a signal degradation, a signal failure, and a power margin.

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14. (Canceled)

15. (Currently Amended) An Ethernet OAM (Operation, Administration and Maintenance) frame for a GE-PON (Gigabit Ethernet Passive Optical Network) system having two path lines located between a splitter and an OLT (Optical Line Terminal) in which only one path line is in a connection state to serve as a working path line, and the other one path line is in a no-connection state to serve as a protection path line, said Ethernet OAM frame comprising:

a switching block located in said OLT for performing a switching operation, said switching operation by means of a operation field contained in the Ethernet OAM frame including;

a notification field for indicating asynchronous information and;

a data field having information generated by an ONU (Optical Network Unit) to request a switching operation between the working path line and the protection path line, wherein said notification field in said Ethernet OAM frame receives switching information in a data frame using a flag bit adapted to transmit asynchronous information of said signaling Ethernet OAM frame between said OLT and said ONUs, and transmit the data frame including said asynchronous information, said Ethernet OAM frame further includes;

a CE field generated when an undefined fault is detected;

a R/S field generated when a local data terminal equipment (STE) detected differs from expectation;

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a L/S field generated when a remote DTE detected differs from expectation;

an LF (Link Fault) field generated when there is an error in a reception end; and

a DG (Dying Gasp) field generated when there is a non-recovery error in the reception.

16. (Original) The OAM frame for GE-PON system as set forth in claim 15, further comprising a flag field having an N-th bit that is adapted to perform an alarm function, wherein the N-th bit indicates the existence of a predetermined condition for requesting the switching operation.

17. (Original) The OAM frame of claim 16, further comprising an operation (OP) code for event notification, the OP code including a predetermined value indicating asynchronous information.

18. (Currently Amended) A method for controlling a GE-PON (Gigabit Ethernet Passive Optical Network) system including:

providing a 2xN splitter; providing an OLT_(Optical Line Terminal) being connected to the 2xN splitter via a first path line or a second path line and having a switching unit for switching the first path line or the second path line upon receiving a predetermined control signal; and providing an ONU (Optical Network Unit), said method comprising the steps of:

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- a) providing a means for the ONU to check the signal environment;
 - b) providing a means for the ONU to generate a switching request according to the checked result and transmitting a packet containing the switching request to the OLT;
 - c) providing a means for the OLT to receive the packet and detecting the switching request; and
 - d) providing a switching block located in the OLT for performing a switching operation upon receiving the switching request from an ONU to switch a current working path line to a protection path line and to switch a current protection path line to the working path line, whereas said automatic switching operation is by means of using a notification field for indicating asynchronous information contained in an Ethernet OAM frame, said notification field in said Ethernet OAM frame receives switching information in a data frame using a flag bit adapted to transmit asynchronous information of said signaling Ethernet OAM frame between said OLT and said ONUs, and transmit the data frame including said asynchronous information; wherein said Ethernet OAM frame further includes:
 - a CE field generated when an undefined fault is detected;
 - a R/S field generated when a local data terminal equipment (STE) detected differs from expectation;
 - a L/S field generated when a remote DTE detected differs from expectation;
 - an LF (Link Fault) field generated when there is an error in a reception
- end; and

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a DG (Dying Gasp) field generated when there is a non-recovery error in the reception.

19. (Previously Presented) The method of claim 18, wherein said notification field in said Ethernet OAM frame receives switching information in a data frame using a flag bit and an OP code that are adapted to transmit asynchronous information of said signaling OAM frame between said OLT and said ONUs, and transmits the data frame including said asynchronous information.

20. (Canceled)

21. (Previously Presented) The apparatus of claim 1, wherein said notification field in said Ethernet OAM receives switching information in a data frame using a flag bit and an OP code that are adapted to transmit asynchronous information of said signaling OAM frame between said OLT and said ONUs, and transmits the data frame including said asynchronous information.

22. (Previously Presented) The notification field in claim 2, wherein an alarm field is provided for detecting either a signal degradation or signal failure and is implemented by an Alarm Indication (AI) bit corresponding to the n^{th} bit contained in the flag bit

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23. (Currently Amended) The Alarm Indication (AI) bit in claim 2022, wherein said alarm indication bit is encoded as a "1" when an alarm condition is detected, so that the alarm condition occurrence can be recognized by the OLT.

24. (Previously Presented) The Ethernet OAM frame for GE-PON system as set forth in claim 15, wherein the data field includes;

- a temperature field (TE);
- a error rate field (ER);
- a power/voltage field (PV); and
- a protection switching field (PS).

25. (Previously Presented) The Ethernet OAM frame for GE-PON system as set forth in claim 15, wherein the operation field is indicated by reference character "EN" and is composed of one octet that consists of hexadecimal representation of a number.